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DEPARTMENT OF THE ARMY 02551.TD  
CORPS OF ENGINEERS, TULSA DISTRICT SEP 1993  
JSH

TULSA DISTRICT GUIDE SPECIFICATION

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SECTION 02551

BITUMINOUS SURFACE COURSE FOR ROADS AND PARKING AREAS

1 GENERAL

1.1 SUMMARY (NOT APPLICABLE)

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 29	(1991a) Unit Weight and Voids in Aggregate
ASTM C 88	(1990) Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C 117	(1990) Materials Finer than 75-um (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C 127	(1988) Specific Gravity and Absorption of Coarse Aggregate
ASTM C 128	(1988) Specific Gravity and Absorption of Fine Aggregate
ASTM C 131	(1981; R 1987) Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C 136	(1984a) Sieve Analysis of Fine and Coarse Aggregates
ASTM C 183	(1988) Sampling and the Amount of Testing of Hydraulic Cement
ASTM D 5	(1986) Penetration of Bituminous Materials
ASTM D 75	(1987) Sampling Aggregates
ASTM D 140	(1988) Sampling Bituminous Materials
ASTM D 242	(1985) Mineral Filler for Bituminous Paving Mixtures
ASTM D 422	(1963; R 1990) Particle-Size Analysis of Soils

ASTM D 946	(1982) Penetration - Graded Asphalt Cement for Use in Pavement Construction
ASTM D 1250	(1980; R 1990) Petroleum Measurement Tables
ASTM D 1856	(1979; R 1984) Recovery of Asphalt from Solution by Abson Method
ASTM D 2041	(1991) Theoretical Maximum Specific Gravity of Bituminous Paving Mixtures
ASTM D 2172	(1992) Quantitative Extraction of Bitumen from Bituminous Paving Mixtures
ASTM D 2216	(1990) Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil-Aggregate Mixtures
ASTM D 3381	(1983) Viscosity - Graded Asphalt Cement for Use in Pavement Construction
ASTM D 3515	(1989) Hot-Mixed, Hot-Laid Bituminous Paving Mixtures

MILITARY STANDARDS (MIL-STD)

MIL-STD-620	(Rev. A; Notice 1) Test Methods for Bituminous Paving Materials
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U.S. ARMY CORPS OF ENGINEERS, WATERWAYS EXPERIMENT STATION (CEWES)

COE CRD-C 119	(1953; Rev. Jun. 1963) Handbook for Concrete Cement, Flat and Elongated Particles in Coarse Aggregate [For Oklahoma]
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OKLAHOMA DEPARTMENT OF TRANSPORTATION (ODOT)

ODOT Standard Specifications	for Highway Construction, Edition of 1988 with 1991 Supplement
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[For Texas] TEXAS STATE DEPARTMENT OF HIGHWAYS AND PUBLIC TRANSPORTATION	(TSDHPT)
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TSDHPT Standard Specifications	for Construction of Highways, Streets and Bridges, 1982]
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### 1.3 UNIT PRICES

#### 1.3.1 Measurement

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NOTE: Paragraphs "Measurement" and "Payment" will be deleted if the work is included in one lump-sum contract price. Lump-sum contracts should not be used when job exceeds 1000 tons.  
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##### 1.3.1.1 Bituminous Mixture

The amount paid for will be the number of 2,000-pound tons of bituminous mixture used in the accepted work. Bituminous mixture shall be weighed

after mixing. No deduction will be made for weight of bituminous materials incorporated herein.

#### 1.3.1.2 Correction Factor for Aggregates Used

Quantities of paving mixtures called for are based on aggregates having a specific gravity of 2.70 as determined in accordance with the Apparent Specific Gravity paragraphs in ASTM C 127 and ASTM C 128. Correction in tonnage of Intermediate- and wearing-course mixtures shall be made to compensate for the difference in the tonnage of mixtures used in the project, when specific gravities of aggregates used in mixtures are more than 2.75 and less than 2.65. Tonnage paid for will be the number of tons used, proportionately corrected for specific gravities, using 2.70 as the base correctional factor.

#### 1.3.1.3 Bituminous Material

Amount paid for will be the number of 2000-pound tons of bituminous materials used in the accepted work.

#### 1.3.2 Payment

Quantities of surface course materials determined as specified above, will be paid for at respective contract unit prices or at reduced prices adjusted in accordance with paragraph "ACCEPTABILITY OF WORK." Payment shall include costs for preparing or reconditioning the base course or existing pavement.

#### 1.4 SUBMITTALS

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NOTE: Submittals must be limited to those necessary for adequate quality control. The importance of an item in the project should be one of the primary factors in determining if a submittal for the item should be required.  
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The following shall be submitted in accordance with SECTION: 01300 -  
SUBMITTAL DESCRIPTIONS:

##### Test Reports

Copies of test reports as required in paragraph: SAMPLING AND TESTING.

##### Records

Waybills and delivery tickets shall be submitted to the Contracting Officer during progress of the work.

#### 1.5 PLANT, EQUIPMENT, MACHINES, AND TOOLS

##### 1.5.1 General

The bituminous plant shall be of such capacity to produce the quantities of bituminous mixtures required. Hauling equipment, paving machines, rollers, miscellaneous equipment, and tools shall be provided in sufficient numbers and capacity and in proper working condition to place the bituminous paving mixtures at a rate equal to the plant output.

### 1.5.2 Straightedge

The Contractor shall furnish and maintain at the site, in good condition, one 12-foot straightedge for each bituminous paver. Straightedges shall be made available for Government use. Straightedges shall be constructed of aluminum or other lightweight metal and shall have blades of box or box-girder cross section with flat bottom reinforced to insure rigidity and accuracy. Straightedges shall have handles to facilitate movement on pavement.

### 1.6 WEATHER LIMITATIONS

Unless otherwise directed, bituminous courses shall not be constructed when temperature of the surface of the existing pavement or base course is below 40 degrees F.

### 1.7 PROTECTION OF PAVEMENT

After final rolling, no vehicular traffic of any kind shall be permitted on the pavement until the pavement has cooled to 140 degrees F.

### 1.8 GRADE AND SURFACE-SMOOTHNESS REQUIREMENTS

Finished surface of bituminous courses, when tested as specified below and in paragraph "ACCEPTABILITY OF WORK," shall conform to gradeline and elevations shown and to surface-smoothness requirements specified.

#### 1.8.1 Plan Grade

The grade of the completed surface shall not deviate more than 0.05-foot from the plan grade.

#### 1.8.2 Surface Smoothness

When a 12-foot straightedge is laid on the surface parallel with the centerline of the paved area or transverse from crown to pavement edge, the surface shall vary not more than 1/4-inch from the straightedge.

### 1.9 GRADE CONTROL

Lines and grades shall be established and maintained by means of line and grade stakes placed at site of work in accordance with the SPECIAL CLAUSES. Elevations of bench marks used by the Contractor for controlling pavement operations at the site of work will be determined, established, and maintained by the Government. Finished pavement elevations shall be established and controlled at the site of work by the Contractor in accordance with bench mark elevations furnished by the Contracting Officer.

### 1.10 SAMPLING AND TESTING

Except as otherwise specified herein in paragraph: ACCEPTABILITY OF WORK, sampling and testing shall be the responsibility of the Contractor. Sampling and testing shall be performed by an approved commercial testing laboratory or by the Contractor subject to approval. Unless otherwise specified, sampling shall be in accordance with ASTM D 75 for aggregates, ASTM C 183 for mineral filler, and ASTM D 140 for bituminous material. Copies of test results shall be furnished to the Contracting Officer. Approval of a source does not relieve the Contractor of responsibility for delivery at the job site of materials meeting the requirements herein.

### 1.10.1 Tests Required

#### 1.10.1.1 Plant Mix

- a. Hot bin gradations (cold-feed gradation when drum mix plant is used), shall be tested in accordance with ASTM C 136 and ASTM C 117. A minimum of one test will be conducted per every 200 tons of wearing course mix placed or fraction thereof, and a minimum of one test conducted per every 350 tons of intermediate course mix placed or fraction thereof.
- b. Marshall Specimens shall be taken in accordance with MIL-STD-620A, Method 104. At least one set of specimens shall be taken per each 200 tons of wearing course mix placed, and one set of specimens shall be taken per each 350 tons of intermediate course mix placed. However, not less than two sets of specimens (three specimens per set) shall be taken in any one day regardless of the quantity of mix placed.
- c. Asphalt extractions shall be performed in accordance with ASTM D 2172, Method A or B. At least one asphalt extraction shall be conducted per day.
- d. Field Density Tests shall be conducted in accordance with MIL-STD- 620A, Method 100. A minimum of one test will be conducted per every 200 tons of wearing course mix placed or fraction thereof, and a minimum of one test conducted per every 350 tons of intermediate course mix placed or fraction thereof.
- e. Thickness Measurements shall be taken at a minimum of one measurement for each 1000 square yards of mix placed.

### 1.11 DELIVERY, STORAGE, AND HANDLING OF MATERIALS

#### 1.11.1 Mineral Aggregates

Mineral aggregates shall be delivered to the site of the bituminous mixing plant and stockpiled in such manner as to preclude fracturing of aggregate particles, segregation, contamination, or intermingling of different materials in the stockpiles or cold-feed hoppers. Mineral filler shall be delivered, stored, and introduced into the mixing plant in a manner to preclude exposure to moisture or other detrimental conditions.

#### 1.11.2 Bituminous Materials

Bituminous materials shall be maintained at appropriate temperature during storage but shall not be heated by application of direct flame to walls of storage tanks or transfer lines. Storage tanks, transfer lines, and weigh buckets shall be thoroughly cleaned before a different type or grade of bitumen is introduced into the system. The asphalt cement shall be heated sufficiently to allow satisfactory pumping of the material; however, the storage temperature shall be maintained below 300 degrees F.

### 1.12 ACCESS TO PLANT AND EQUIPMENT

The Contracting Officer shall have access at all times to all parts of the paving plant for checking adequacy of the equipment in use; inspecting operation of the plant; verifying weights, proportions, and character of materials; and checking temperatures maintained in preparation of the mixtures.

### 1.13 WAYBILLS AND DELIVERY TICKETS

Before the final statement is allowed, the Contractor shall file with the Contracting Officer certified waybills and certified delivery tickets for all aggregates and bituminous materials actually used in construction.

## 2 PRODUCTS

### 2.1 HOT-MIX SURFACE COURSE

[for Oklahoma]

[Bituminous hot-mix surface course shall conform to the requirements of the OTOT Standard Specifications for Plant Mix Asphalt Concrete Pavement Section 411 and 411A except as specified hereinafter.]

For Texas]

[Bituminous hot-mix surface course shall conform to the requirements of the TSDHPT Standard Specifications for "Hot-Mix Asphaltic Concrete Pavement," Item 340, except as specified hereinafter.]

### 2.2 ASPHALT

[For Oklahoma]

Asphalt material for the surface course shall be asphalt cement, Type AC-20, conforming to Oklahoma State Highway Commission Standard Specification for "Asphalt Materials", Section 708R.03. Asphalt material shall come from a source approved for use by the Oklahoma Department of Transportation. The seal number from the tank and the number of the ODOT Laboratory test report shall be furnished to the Contracting Officer.

[For Texas]

[Asphalt material for the surface course shall be asphalt cement AC-20 conforming to TSDHPT Standard Specification for "Asphalts, Oils, and Emulsions," Item 300. Asphalt material shall come from a source approved for use by the TSDHPT. The seal number from the tank and the number of the TSDHPT Laboratory test report shall be furnished to the Contracting Officer.]

### 2.3 PAVING

[For Oklahoma]

Paving mixture shall be Type "C".

[For Texas]

[Paving mixture shall be Type "D".]

### 2.4 CHANGES

[For Oklahoma]

ODOT Standard Specifications shall be modified as follows:

(a) Density and stability requirements shall not apply.

(b) Construction methods paragraph shall not apply.

(c) The measurement and payment paragraphs shall not apply

[For Texas]

[TSDHPT Standard Specification shall be modified as follows:

- (a) Material retained on the No. 10 screen shall not exceed 65 percent.
- (b) Density and stability requirements shall not apply.
- (c) Construction methods paragraph shall not apply.
- (d) The measurement and payment paragraphs shall not apply.]

## 2.5 PROPORTIONING OF MIXTURE

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**NOTE: Delete the words in brackets in paragraph 2.2.1 if paragraph ACCEPTABILITY OF WORK is deleted.**

### 2.5.1 Job Mix Formula

[For Oklahoma]

No bituminous mixture shall be manufactured until the grading and asphalt content of the proposed mix has been furnished by the plant for the Contracting Officer's approval. The formula will indicate the percentage of each sieve fraction of aggregate, percentage of asphalt, and temperature of the completed mixture when discharged from the mixer. The job-mix formula will be allowed the tolerances specified in the ODOT Standard Specification, Section 411 and 411A. The bitumen content and aggregate gradation may be adjusted within the limits of the gradation tables specified therein to improve the paving mixtures, as directed, without adjustments in the contract price. The percentages of each sieve fraction in the job-mix formula will be restricted to values such that the applicable of the specified tolerances will not cause the limits of the gradation tables to be exceeded.

[For Texas]

[The JMF for the bituminous mixture shall be furnished to the Contracting Officer for approval. No payment will be made for mixtures produced prior to the approval of the JMF. The formula will indicate the percentage of each stockpile and mineral filler, the percentage of each size aggregate, the percentage of bitumen, and the temperature of the completed mixture when discharged from the mixer. The tolerances specified in the TSDHPT Standard Specification, Item 340 will be allowed for asphalt content, temperature, and aggregate grading for tests conducted on the mix as discharged from the mixing plant; [however, the final evaluation of aggregate gradation and asphalt content will be based on paragraph ACCEPTABILITY OF WORK.] Bituminous mix that deviates more than 25 degrees F. from the JMF shall be rejected. The JMF may be adjusted during construction to improve paving mixtures, as directed, without adjustments in the contract prices.]

### 2.5.2 Test Properties of Bituminous Mixtures

Finished mixture shall meet requirements described below when tested in accordance with MIL-STD-620, Method 100. All samples will be compacted with 50 blows of specified hammer on each side of sample. When bituminous mixture fails to meet the requirements specified below, the paving operation shall be stopped until the cause of noncompliance is determined and corrected.

### 2.5.2.1 Stability, Flow, and Voids

Requirements for stability, flow, and voids are shown in TABLES I and II for nonabsorptive and absorptive aggregates, respectively.

TABLE I. NONABSORPTIVE-AGGREGATE MIXTURE

Stability minimum, pounds	500
Flow maximum, 1/100-inch units	20
Voids total mix, percent (1)	3-5
Voids filled with bitumen, percent	75-85

(1) The Contracting Officer may permit deviations from limits specified when gyratory method of design is used to develop the JMF.

TABLE II. ABSORPTIVE-AGGREGATE MIXTURE

Stability minimum, pounds	500
Flow maximum, 1/100-inch units	20
Voids total mix, percent (1)	2-4
Voids filled with bitumen, percent	80-90

(1) The Contracting Officer may permit deviations from limits specified when gyratory method of design is used to develop the JMF.

a. When the water-absorption value of the entire blend of aggregate does not exceed 2.5 percent as determined in accordance with ASTM C 127 and ASTM C 128, the aggregate is designated as nonabsorptive. The theoretical specific gravity computed from the apparent specific gravity or ASTM D 2041 will be used in computing voids total mix and voids filled with bitumen, and the mixture shall meet requirements in TABLE I.

b. When the water-absorption value of the entire blend of aggregate exceeds 2.5 percent as determined in accordance with ASTM C 127 and ASTM C 128, the aggregate is designated as absorptive. The theoretical specific gravity computed from the bulk-impregnated specific gravity method contained in MIL-STD-620, Method 105, or ASTM D 2041 shall be used in computing percentages of voids total mix and voids filled with bitumen. The mixture shall meet requirements in TABLE II.

### 2.5.3 Stability

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**NOTE: The antistripping agent when added to the mix must be able to produce an index of retained stability of at least 75 percent.**  
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The index of retained stability shall be greater than 75 percent as determined by MIL-STD-620, Method 104. When the index of retained stability is less than 75, the aggregate stripping tendencies may be corrected by the use of hydrated lime or by treating the bitumen with an approved antistripping agent. The hydrated lime shall be considered as mineral filler and included in the gradation requirements. The amount of hydrated lime or antistripping agent added to bitumen shall be sufficient, as approved, to produce an index of retained stability of not less than 75 percent. No additional payment will be made to the Contractor for addition of antistripping agent required.



### 3 EXECUTION

#### 3.1 BASE COURSE CONDITIONING

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NOTE: The type of base course on which the bituminous intermediate and/or wearing courses are to be constructed will be inserted in the blanks. If project does not involve construction of bituminous courses on base course, delete this paragraph.  
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The surface of the base course will be inspected for adequate compaction and surface tolerances specified in SECTION: [ ]. Unsatisfactory areas shall be corrected.

#### 3.2 EXISTING PAVEMENT CONDITIONING

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NOTE: Appropriate statements covering the required conditioning of the existing pavement will be inserted.  
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#### 3.3 PREPARATION OF BITUMINOUS MIXTURES

Rates of feed of aggregates shall be regulated so that the moisture content and temperature of aggregates will be within specified tolerances. Aggregates, mineral filler, and bitumen shall be conveyed into the mixer in proportionate quantities required to meet the JMF. Mixing time shall be as required to obtain a uniform coating of the aggregate with the bituminous material. Temperature of bitumen at time of mixing shall not exceed 300 degrees F. Temperature of aggregate and mineral filler in the mixer shall not exceed 325 degrees F when bitumen is added. Overheated and carbonized mixtures or mixtures that foam shall not be used.

#### 3.4 WATER CONTENT OF AGGREGATES

Drying operations shall reduce the water content of mixture to less than 0.75 percent. The water content test will be conducted in accordance with ASTM D 2216; the weight of the sample shall be at least 500 grams. If the water content is determined on hot bin samples, the water content will be a weighted average based on composition of blend.

#### 3.5 STORAGE OF BITUMINOUS PAVING MIXTURE

Storage shall conform to the applicable requirements of ASTM D 3515; however, in no case shall the mixture be stored for more than 4 hours.

#### 3.6 TRANSPORTATION OF BITUMINOUS MIXTURE

Transportation from paving plant to site shall be in trucks having tight, clean, smooth beds lightly coated with an approved releasing agent to prevent adhesion of the mixture to the truck bodies. Excessive releasing agent shall be drained prior to loading. Each load shall be covered with canvas or other approved material of ample size to protect mixture from weather and to prevent loss of heat. Loads that have crusts of cold, unworkable material or that have become wet will be rejected. Hauling over freshly placed material will not be permitted.

### 3.7 SURFACE PREPARATION OF UNDERLYING COURSE

Prior to placing of the intermediate or wearing course, the underlying course shall be cleaned of all foreign or objectionable matter with power brooms and hand brooms.

### 3.8 PRIME COATING

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**NOTE: If project does not involve construction of bituminous courses on base course, delete this paragraph.**  
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Surfaces of previously constructed base course shall be sprayed with a coat of bituminous material in accordance with SECTION: 02559 - BITUMINOUS PRIME COAT.

### 3.9 TACK COATING

Contact surfaces of curbs, manholes, and other structures as shown shall be sprayed with bituminous tack coat material in accordance with SECTION: 02558 - BITUMINOUS TACK COAT.

### 3.10 PLACING

Bituminous courses shall be constructed only when the base course or existing pavement has no free water on the surface. Bituminous mixtures shall not be placed without ample time to complete spreading and rolling during daylight hours, unless approved satisfactory artificial lighting is provided.

#### 3.10.1 Offsetting Joints

The wearing course shall be placed so that longitudinal joints of the wearing course will be offset from joints in the intermediate course by at least 1-foot. Transverse joints in the wearing course shall be offset by at least 2 feet from transverse joints in the intermediate course.

#### 3.10.2 Placement With Mechanical Spreader

Temperatures of mixtures, when dumped into the mechanical spreader, will be as determined by the Government. Mixtures having temperatures less than 225 degrees F when dumped into the mechanical spreader shall not be used. The mechanical spreader shall be adjusted and the speed regulated so that the surface of the course being laid will be smooth and continuous without tears and pulls, and of such depth that, when compacted, the surface will conform to the cross section indicated. Placing with respect to center line areas with crowned sections or high side of areas with one-way slope shall be as directed. Placing of the mixture shall be as nearly continuous as possible, and speed of placing shall be adjusted, as directed, to permit proper rolling. When segregation occurs in the mixture during placing, the spreading operation shall be suspended until the cause is determined and corrected.

#### 3.10.3 Placing Strips Succeeding Initial Strips

In placing each succeeding strip after initial strip has been spread and compacted as specified below, the screed of the mechanical spreader shall overlap the previously placed strip 2 to 3 inches and be sufficiently high

so that compaction produces a smooth dense joint. Mixture placed on the edge of a previously placed strip by the mechanical spreader shall be pushed back to the edge of the strip by use of a lute. Excess mixture shall be removed and wasted.

#### 3.10.4 Hand Spreading

In areas where the use of machine spreading is impractical, the mixture shall be spread by hand. Spreading shall be in a manner to prevent segregation. The mixture shall be spread uniformly with hot rakes in a loose layer of thickness that, when compacted, will conform to required grade, density, and thickness.

#### 3.11 COMPACTION OF MIXTURE

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**NOTE: Delete the two sentences in brackets if paragraph "ACCEPTABILITY OF WORK" is deleted.**  
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Rolling shall begin as soon after placing as the mixture will bear a roller without undue displacement. Delays in rolling freshly spread mixture will not be permitted. After initial rolling, preliminary tests of crown, grade, and smoothness shall be made by the Contractor. Deficiencies shall be corrected so that the finished course will conform to requirements for grade and smoothness specified herein. [Crown, grade, and smoothness will be checked in each lot of completed pavement by the Contracting Officer for compliance and will be evaluated as specified in paragraph "ACCEPTABILITY OF WORK."] After the Contractor is assured of meeting crown, grade, and smoothness requirements, rolling shall be continued until a mat density of 97.0 to 100.0 percent and a joint density of 95.0 to 100.0 percent of density of laboratory-compacted specimens of the same mixture is obtained. [The density will be determined and evaluated as specified in paragraph "ACCEPTABILITY OF WORK."] Places inaccessible to rollers shall be thoroughly compacted with hot hand tampers.

#### 3.12 TESTING OF MIXTURE

At the start of the plant operation, a quantity of mixture shall be prepared that is sufficient to construct a test section at least 50 feet long, two spreader widths wide and of thickness to be used in the project. Mixture shall be placed, spread, and rolled with equipment to be used in the project and in accordance with the requirements specified above. This test section shall be tested and evaluated according to specified requirements. If test results are satisfactory, the test section shall remain in place as part of the completed pavement. If tests indicate that the pavement does not conform to specification requirements, necessary adjustments to plant operations and rolling procedures shall be made immediately, and test section will be evaluated as specified in paragraph "ACCEPTABILITY OF WORK." Additional test sections, as directed, shall be constructed and sampled for conformance to specification requirements. In no case shall the Contractor start full production of surface course mixture without approval. The test section lot is in addition to lot(s) required by paragraph "ACCEPTABILITY OF WORK."

#### 3.13 CORRECTING DEFICIENT AREAS

Mixtures that become contaminated or are defective shall be removed to the full thickness of the course. Edges of the area to be removed shall be cut so that sides are perpendicular and parallel to the direction of traffic and

so that the edges are vertical. Edges shall be sprayed with bituminous materials conforming to SECTION: 02558 - BITUMINOUS TACK COAT. Fresh paving mixture shall be placed in the excavated areas in sufficient quantity so that the finished surface will conform to grade and smoothness requirements. Paving mixture shall be compacted to the density specified herein. Skin patching of an area that has been rolled shall not be permitted.

### 3.14 JOINTS

#### 3.14.1 General

Joints between old and new pavements, between successive work days, or joints that have become cold (less than 175 degrees F) shall be made to insure continuous bond between the old and new sections of the course. All joints shall have the same texture and smoothness as other sections of the course. Contact surfaces of previously constructed pavements coated by dust, sand, or other objectionable material shall be cleaned by brushing or shall be cut back as directed. When directed by the Contracting Officer, the surface against which new material is placed shall be sprayed with a thin, uniform coat of bituminous material conforming to SECTION: 02558 - BITUMINOUS TACK COAT. Material shall be applied far enough in advance of placement of a fresh mixture to insure adequate curing. Care shall be taken to prevent damage or contamination of the sprayed surface.

#### 3.14.2 Transverse Joints

The roller shall pass over the unprotected end of a strip of freshly placed material only when placing is discontinued or delivery of the mixture is interrupted to the extent that the material in place may become cold. In all cases, prior to continuing placement, the edge of previously placed pavement shall be cut back to expose an even vertical surface for full thickness of the course. In continuing placement of a strip, the mechanical spreader shall be positioned on the transverse joint so that sufficient hot mixture will be spread to obtain a joint after rolling that conforms to the required density and smoothness specified herein.

#### 3.14.3 Longitudinal Joints

Edges of a previously placed strip shall be prepared such that the pavement in and immediately adjacent to the joint between this strip and the succeeding strip meets the requirements for grade, smoothness, and density.

### 3.15 ACCEPTABILITY OF WORK

#### 3.15.1 General

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NOTE: The lot size can be specified on the basis of time (i.e., 4 hours, 1 day, etc.) or amount of production (i.e., 500 tons, 1,000 tons, etc.). If the lot size is based on the amount or production, it should be selected to be approximately equal to the amount of asphalt mix produced in one day's operation. The lot size should not exceed 2000 tons of asphalt mix. For accuracy in determination of penalties to be deducted from Contractor payments, asphalt mixture should be bid by the ton in the Bidding Schedule.

**Delete this paragraph if the total project is less  
than 1000 tons.**

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A lot shall be that quantity of construction that will be evaluated for compliance with specification requirements. A lot shall be equal to 500 tons. The Government will conduct all initial acceptance tests. Additional tests required to determine acceptability of nonconforming material will be preformed by the Government at the expense of the Contractor.

#### 3.15.1.1 Lot Evaluation

In order to evaluate aggregate gradation, asphalt content, and density, each lot shall be divided into four equal sublots. For density determination, one random sample shall be taken from the mat of each subplot from the joint of each subplot. A coring machine shall be used for taking mat and joint samples from the completed pavement. Core samples shall be taken with the coring machine centered over the joint. After air drying to a constant weight, random samples obtained from the mat shall be used for density determination in accordance with MIL-STD-620, Method 101. Samples for determining asphalt content and aggregate gradation shall be taken from loaded trucks within each subplot. Asphalt content shall be determined in accordance with ASTM D 2172, Method A or B. Aggregate gradation shall be determined for the mix by testing the recovered aggregate in accordance with ASTM C 136 and ASTM C 117.

#### 3.15.1.2 Lot Failure

When a lot of material fails to meet the specification requirements, that lot shall be removed and replaced or accepted at a reduced price. The lowest percent payment for any pavement characteristic (i.e., gradation, asphalt content, density, grade, and smoothness) defined below shall be the percent payment for that lot. The percent payment is based on the pavement characteristics and the contract [unit] price.

#### 3.15.2 Optional Sampling and Testing

The Contracting Officer reserves the right to sample and test any area which appears to deviate from the specification requirements. Testing in these areas will be in addition to the lot testing, and the requirements for these areas will be the same as those for a lot.

#### 3.16 AGGREGATE GRADATION

The mean absolute deviation of the four subplot aggregate gradations from the JMF for each sieve size will be evaluated and compared with TABLE III. The percent payment based on aggregate gradation shall be the lowest value determined for any sieve size in TABLE III. All tests for aggregate gradation will be completed and reported within 24 hours after completion of construction of each lot. The computation of mean absolute deviation for one sieve size is illustrated below:

Example: Assume the following JMF and subplot test results for aggregate gradation

Percent by Weight Passing Sieves

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Sieve	Test	Test	Test	Test
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Size	JMF	No. 1	No. 2	No. 3	No. 4
19 mm	100	100	100	100	100
12.5 mm	88	87	88	90	88
9.5 mm	75	72	77	78	74
4.75 mm	64	60	65	67	62
2.36 mm	53	50	56	57	52
1.18 mm	42	39	44	45	41
0.600 mm	32	30	34	35	32
0.300 mm	20	17	20	22	21
0.150 mm	10	8	10	10	11
0.075 mm	6	4	7	8	6

Percent by Weight Passing Sieves

Sieve Size	JMF	Test No. 1	Test No. 2	Test No. 3	Test No. 4
3/4 inch	100	100	100	100	100
1/2 inch	88	87	88	90	88
3/8 inch	75	72	77	78	74
No. 4	64	60	65	67	62
No. 8	53	50	56	57	52
No. 16	42	39	44	45	41
No. 30	32	30	34	35	32
No. 50	20	17	20	22	21
No. 100	10	8	10	10	11
No. 200	6	4	7	8	6

Mean Absolute Deviation (for 75 micrometer No. 200 seive) = ((Absolute value of 4-6) + (Absolute value of 7-6) + (Absolute value of 8-6) + (Absolute value of 6-6))/4 = (2 + 1 + 2 + 0)/4 = 1.25

The mean absolute deviation for other sieve sizes can be determined in a similar way for this example to be:

Sieve Size	19 mm	12.5 mm	9.5 mm	4.75 mm	2.36 mm	1.18 mm	0.600 mm	0.300 mm	0.075 mm
Mean Absolute Deviation	0	0.75	2.25	2.50	2.75	2.25	1.75	1.50	0.75

  

Sieve Size	3/4 inch	1/2 inch	3/8 inch	No. 4	No. 8	No. 16	No. 30	No. 50	No. 100
Mean Absolute Deviation	0	0.75	2.25	2.50	2.75	2.25	1.75	1.50	0.75

The least percent payment based on any sieve size listed in TABLE V would be 98 percent for the 75 micrometer No. 200 sieve. Therefore for this example the percent payment based on aggregate gradation is 98 percent.

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**NOTE: If State specifications are referenced in paragraph 2., the gradation deviation table (Table III) may require adjustments to be compatible with the State aggregate gradation specified.**

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TABLE III. PERCENT PAYMENT BASED ON AGGREGATE GRADATIONS

Sieve Size	Mean Absolute Deviation of Aggregate Gradation from JMF						
	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0	5.1-6.0	
Above 6.0							
3/4 inch	100	100	100	100	98	95	90
1/2 inch	100	100	100	100	98	95	90
3/8 inch	100	100	100	100	98	95	90
No. 4	100	100	100	100	98	95	90
No. 8	100	100	100	98	95	90	reject
No. 16	100	100	100	98	95	90	reject
No. 30	100	100	100	98	95	90	reject
No. 50	100	100	100	98	95	90	reject
No. 100	100	98	95	90	90	reject	reject
No. 200	100	98	90	reject	reject	reject	reject

### 3.17 ASPHALT CONTENT

The mean absolute deviation of the four asphalt contents from the JMF will be evaluated and compared with TABLE IV. The percent payment based on asphalt content shall be the value determined in TABLE IV. Asphalt content tests shall be completed and reported within 24 hours after construction of the lot.

TABLE IV. PERCENT PAYMENT BASED ON ASPHALT CONTENT

Mean Absolute Deviation of Extracted Asphalt Content from JMF

	Percent Payment	
	100	0.25-0.30
less than 0.25		
98 0.31-0.35		95 0.36-0.40
90		
above 0.40		reject

### 3.18 DENSITY

The average mat and joint densities will be expressed as a percentage of the laboratory density. The laboratory density for each lot will be determined in accordance with MIL-STD-620, Method 100 from four sets of laboratory samples. The sample obtained from each of the four sublots will be divided into three specimens to produce one set of laboratory samples. Laboratory samples will be prepared from asphalt mixture which has not been reheated. Samples will be compacted at 250 degrees F within 2 hours of the time the mixture was prepared at the asphalt plant. Laboratory samples will be prepared in accordance with MIL-STD- 620, Method 100.

#### 3.18.1 Field Density

The field density will be determined and compared with TABLE V. The percent payment based on density shall be the lowest value determined from TABLE V.

The percent payment based on mat density will be for all of the material placed in the lot. The percent payment based on joint density will be for the amount of material represented by an area equal to the lot joint length by 10 feet wide not to exceed the lot size.

TABLE V. PERCENT PAYMENT BASED ON DENSITY

TABLE VII. PERCENT PAYMENT BASED ON DENSITY

Average Mat Density (4 Cores)	Percent Payment	Average Joint Density (4 Cores)
97.0-100.0	100.0	95.0-100.0
96.9	100.0	94.9
96.8-100.1	99.9	94.8
96.7	99.8	94.7
96.6-100.2	99.6	94.6
96.5	99.4	94.5
96.4-100.3	99.1	94.4
96.3	98.7	94.3
96.2-100.4	98.3	94.2
96.1	97.8	94.1
96.0-100.5	97.3	94.0
95.9	96.3	93.9
95.8-100.6	94.1	93.8
95.7	92.2	93.7
95.6-100.7	90.3	93.6
95.5	87.9	93.5
95.4-100.8	85.7	93.4
95.3	83.3	93.3
95.2-100.9	80.6	93.2
95.1	78.0	93.1
95.0-101.0	75.0	93.0
below 95.0, above 101.0	reject	below 93.0

### 3.18.2 Lot Density

All density results on a lot will be completed and reported within 24 hours after construction of that lot. When the Contracting Officer considers it necessary to take additional samples for density measurements, samples will be taken in groups of four (one for each subplot). The percent payment will be determined for each additional group of four samples and averaged with the percent payment for the original group to determine the final percent payment. The Contractor shall fill all sample holes with hot mix and compact.

### 3.19 GRADE

Grade-conformance tests will be conducted by the Government. The finished surface of the pavement will be tested for conformance with plan-grade requirements. Within 5 working days after completion of placement of a particular lot, the Contracting Officer will inform the Contractor in writing of results of grade-conformance tests. The finished grade of each pavement area shall be determined by running lines of levels at intervals of 25 feet or less longitudinally and transversely to determine the elevation of the completed pavement. When more than 5 percent of all measurements



made within a lot are outside the tolerances specified in paragraph "GRADE AND SURFACE-SMOOTHNESS REQUIREMENTS," the payment for that lot will not exceed 95 percent. In areas where the grade exceeds the plan-grade tolerances given in paragraph "GRADE AND SURFACE-SMOOTHNESS REQUIREMENTS" by more than 50 percent, the Contractor shall remove the deficient area and replace with fresh paving mixture at no additional cost to the Government. Sufficient material shall be removed to allow at least 1-inch of asphalt concrete to be placed. Skin patching for correcting low areas or planing for correcting high areas shall not be permitted.

### 3.20 SURFACE SMOOTHNESS

After completion of final rolling of a lot, the compacted surface will be tested by the Government with a 12-foot straightedge. Measurements will be made perpendicular to and across all mats at distances along the mat not to exceed 25 feet. Location and deviation from straightedge of all measurements will be recorded. When more than 5 percent of all measurements along the mat within a lot exceed the specified tolerance, the percent payment for that lot shall not exceed 95 percent. Any joint or mat area surface deviation which exceeds the tolerance given in paragraph "GRADE AND SURFACE-SMOOTHNESS REQUIREMENTS" by more than 50 percent shall be corrected to meet the specification requirements. The Contractor shall remove the deficient area and replace with fresh paving mixture at no additional cost to the Government. Sufficient material shall be removed to allow at least 1-inch of asphalt concrete to be placed. Skin patching for correcting low areas or planing for correcting high areas shall not be permitted.